

PATENT SPECIFICATION (11)

1 326 642

DRAWINGS ATTACHED (19)

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- (21) Application No. 38260/70 (22) Filed 7 Aug. 1970
(31) Convention Application No. 853441 (32) Filed 27 Aug. 1969 in
(33) United States of America (US)
(44) Complete Specification published 15 Aug. 1973
(51) International Classification B05B 7/30 F23Q 2/16 2/46
(52) Index at acceptance
B2F 11B 5B1 5B4Y 5B5 5D2A2A 5D5C2X 8A
BIT 421 54X 604 712 750 782
F4F 9B3X 9D3 9DX 9E1B 9E1X 9EX 9EY



(54) FILTER ASSEMBLY FOR FLUID DISPENSERS

(71) We, CIBA-GEIGY AG, a body corporate organised according to the laws of Switzerland, of Basle, Switzerland, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to an assembly for dispensers of fluid products, comprising a plug valve means in the bottom of which a high pressure gasket is held in position by a retaining ring, the retaining ring being flexible and of metal and being secured to the assembly and a propellant cartridge containing a liquefied gas adsorbed or absorbed in silica of particulate or gel form or some similar materials, the cartridge being secured in gas-tight relationship to said retaining ring and valve means. The term "adsorption" will be used hereinafter to designate both adsorption and absorption, as well as a combination thereof, when discussing the taking up of the propellant gas by adsorbent or absorbent, particulate or gel materials.

There is already known in the art a pushbutton dispenser for dispensing a fluid product constituting an active agents in fractional amounts and in a spray, by means of a propellant gas under pressure adsorbed in a material such as silica gel in a propellant cartridge placed inside the product container which contains said fluid product, and which cartridge is attached to a valve housing being a part of the valve means of the dispenser and being integral with or attached to a cover which forms the top of the aforementioned product container. This valve housing contains as parts of the valve means a high pressure obturating means for the propellant cartridge and a low pressure obturating means controlling at least the passage of the product from the container to a spray nozzle, which is located in the pushbutton, and in some instances the passage of air from the outside to the inside of the product container. The valve means further comprise a

valve shaft or stem which conducts the propellant and the product in the direction of the spray nozzle, and which is slidably mounted in the valve housing and controls the aforementioned obturating means. This dispenser has a gasket, serving as the high pressure obturator, mounted in the bottom of the valve housing, said gasket being held therein by a substantially rigid retaining ring.

The high pressure gasket is positioned in a recess in the valve housing, which opens toward the propellant cartridge, and is held in said recess by means of the retaining ring which also forms part of the closure for said propellant cartridge. The retaining ring member comprises an annular portion which is forced into the recess in the valve housing and has a 'downwardly and outwardly extending portion positioned between the valve housing and the collar of the propellant cartridge. In dispensers of this type, if pulverulent silica or a like adsorbent is used in the propellant cartridge, the possibility exists for small particles of the adsorbent to leave the cartridge, pass through the stem and clog the propellant orifice in the nozzle. In order to eliminate this possibility, a filter of some sort is desirable between the propellant cartridge and the opening through the valve assembly which gives access to the stem.

A desirable place for a piece of filter material would be across the retaining ring which holds the obturator for the valve stem in the recess in the support. However, in order to make sure that the filter stays in place, it should be secured to the retaining ring. The easiest way to do this is to secure it by means of adhesive. The drawback in this manner of securing it is that at least three operations are involved, first the cutting out of the piece of filter material to the appropriate size and shape, applying adhesive to the retaining ring, and then bringing the filter and the retaining ring together to make them adhere to each other.

Because dispensers of the type in question must be produced as inexpensively as possible, it is necessary to reduce the number of

operations involved in their manufacture and assembly to a minimum.

According to the present invention there is provided a retaining ring assembly for use with a propellant container of an aerosol dispenser in which container propellant under pressure is adsorbed on an adsorbent and is releasable in gaseous form via a valve assembly including a valve shaft, a valve housing, a high pressure seal for controlling the flow of gaseous propellant and a discharge nozzle; wherein the retaining ring assembly comprises a retaining ring for covering the opening of the container and having a base the outer edge of which is adapted to be secured to the valve housing and to the container, the ring having a projecting part formed around a central opening for projecting into the valve housing and abutting against the said seal when the aerosol dispenser is assembled together, the side of the base of the retaining ring destined to face towards the interior of the container having a filter element secured thereto for preventing penetration of adsorbent particles into the valve shaft which element is, however, permeable to gaseous propellant.

Preferably, the container is filled with inflammable propellant adsorbed on a pulverulent silica carrier.

Preferably, the base of the retaining ring has a depending and outwardly flaring skirt formed with a ring-like cutting edge at its free end, the inner surface of the cutting edge forming a receiving surface on which the filter element is held in position.

The present invention also provides a method of producing a retaining ring assembly as set forth in the preceding paragraph, comprising dipping said cutting edge into a bath of adhesive, placing the cutting edge on a sheet of filter material, and pushing the cutting edge into the filter sheet to cut out a filter element which will adhere by the inner surface of the cutting edge on removal of the retaining ring from the filter sheet.

The retaining ring may be of aluminum or like metal and holds a high pressure gasket in a preferably conically flaring open recess at the end of a central passageway at one end of a valve housing of a plug valve propellant cartridge assembly. The annular cutting edge provided on the retaining ring projects downwardly from the retaining ring when the dispenser is in the upright position.

In manufacture, the cutting edge on the retaining ring is first coated with adhesive around its inside and then it is pressed onto a sheet of filter material to cut from the filter material a filter which fits exactly into the cutting edge. When the retaining ring is lifted from the sheet of filter material, it carries with it the cut-out disc-shaped

filter element, and there results an assembly of the retaining ring and the filter element which is ready to be positioned in the dispenser with the filter in position across the path of the propellant from the cartridge to the opening into the valve stem.

Other features and advantages of the present invention will be brought out in the following description and accompanying drawings, in which:

Figure 1 is a sectional view of a dispenser of the type in which the invention is incorporated;

Figure 2 is an axial sectional view of the upper part of an embodiment of the dispenser according to the present invention;

Figure 3 is a view similar to Figure 2 showing the parts in the dispensing positions;

Figure 4 is a sectional elevation view of the retaining ring;

Figure 5 is a sectional elevation view of the assembly of the retaining ring and filter; and

Figures 6a to 6d are views of the operations for forming the assembly of Figure 5.

Figure 7 shows in a cross-section similar to that of Figures 2 and 3 the valve means and adjacent portion of a propellant cartridge in which the valve means are adapted for releasing inflammable fluid.

Referring to Figures 1 and 2 of the attached drawings, a dispenser comprises a container C which is adapted to hold a flowable product such as a liquid or a finely divided powder. When the dispenser is used to emit an inflammable gas, this container can be used as a safety mantle about a propellant cartridge 43 and be filled with a protective material, e.g. asbestos or slag wool or the like. The product container is closed by a cover 1 from which depends a plug valve. The propellant cartridge 43 depends from a valve housing 2 of the plug valve into the interior of the container C. The cover 1 is made, for example, of plastics material to which valve housing 2 is attached, these parts mutually abutting each other at a joint 3 where they fit together. Between these parts a flexible annular low pressure sealing gasket 4 is held which is the low pressure obturator for the active agent and the low pressure obturator for the admission of air to the interior of the product container C from the outside. Parts 1 and 2 may be attached to each other, for example, by ultrasonic welding.

Cover 1 has a central opening 5 and valve housing 2 has an axial central passageway or bore 6 therein; through opening 5 and passageway 6 there extends a valve stem 7 which is connected to a valve actuator in the form of a pushbutton 8 containing inserted therewith a Venturi-type spray nozzle 9. An annular rib or shoulder 16 having an aperture 12 is provided in passageway 6 which ends in

an outwardly widening recess 65 in a dependent sleeve portion 13 at the base of valve housing 2.

5 A high pressure obturator in the form of an annular gasket 15 is mounted in the downwardly opening recess 65 of passageway 6 and rests against the underside of the annular rib or shoulder 16. Through aperture 12 the upper, (as viewed), cup-shaped portion of passageway 6 is connected with recess 65.

10 Valve stem 7 is made in one piece, for example, by moulding, and has an axial duct 17 with a frusto-conical stem head 18 closing the duct end toward the propellant cartridge. Radial apertures 19 in the wall of valve stem 7 adjacent the head 18 lead into duct 17 and are closed by the inner annular face of gasket 15 to prevent passage of gaseous propellant into duct 17, when the valve stem 7 is in the undepressed position.

15 A spring 25 is positioned around valve stem 7 between a flange 24 of the stem and the annular rib 16 and urges the flange 24 upwardly so that the flexible lip of gasket 4 is held between a truncated cone-shaped surface 26 on flange 24, cambered as shown in Figure 2, and an annular projection 28 around the edge of opening 5 in cover 1, which projection 28 serves also to seal an air inlet passage 32. This provides a tight closure of central passageway 6 with respect to opening 5.

20 Pushbutton 8 caps valve stem 7 and defines channels 21, along the outside of the stem 17, in a manner known per se and described, for instance, in U.S. patent 3,451,596 of June 24, 1969. Channels 21 open out of the stem through apertures 23.

25 The under surface 78 of said flange 24 is plane and serves as a support for spring 25, but this flange 24 also serves as a movable stop for the pushbutton assembly.

30 Means for admitting the product to be dispensed, for example, the upper end of a dip tube 29, is force-fitted in a bore 31 of valve housing 2 and opens into the central passageway 6 of the latter. Alternatively a flexible bag or sac containing the product to be dispensed may be attached by way of a mouthpiece in the bore 31.

35 Gasket 15 is held in recess 65 against shoulder 16 by a retaining ring 66. The latter is an independent member made of a material impermeable to the propellant, preferably metal such as aluminium, and has a central generally tubular portion 66c flared downwardly and outwardly at 66d, somewhat in the shape of a truncated cone, as shown in Figure 4. The tubular portion 66c of the retaining ring has a central hollow 67 into which the frusto-conical head 18 of valve stem 7 extends. The upper edge of the tubular portion 66c may be relatively sharp so as to dig slightly into the underside of

gasket 15. Alternatively, a shoulder 66b may be formed by the bent-over upper edge of the tubular portion 66c, as shown in Figure 4, which shoulder 66b bears on the underside of gasket 15.

70 An outer cylindrical cavity 70 is defined at the lower end of valve housing 2 by an annular flange 68 which surrounds the sleeve portion 13 of the housing. The peripheral edge of the lower end of retaining ring 66 is curved upwardly and outwardly at 66a to form a flange 71 which is seated against the lower edge of annular flange 68 of the valve housing 2. A sealing gasket 101, for example a flowed-in gasket or a preformed ring-shaped gasket of a synthetic rubber material such as Buna-N, a synthetic rubber formed by copolymerization of butadiene and acrylonitrile sold by I. G. Farben Industries, or Neoprene (Registered Trade Mark), a long-chain synthetic rubber made by polymerization of chloroprene, and sold by DuPont, is held between the flange 71 and a collar 69 of propellant cartridge 43. The terminal portion of the propellant cartridge is bent so as to fit closely about the contour of annular dependent flange 68, flange 71 and gasket 101, thus forming a tight joint at the top of the propellant cartridge 43. The fact that retaining ring 66 is made of a material which is impermeable with respect to the propellant prevents leakage of propellant in gaseous form through the material of valve housing 2, even when the latter material itself is not impervious to the propellant.

100 The lower end of the downwardly and outwardly flared portion 66d of retaining ring 66 is provided with an annular cutting edge 66e which projects downwardly from the retaining ring 66 when the dispenser is in the upright position. Secured in the annular cutting edge 66e and forming a bottom in the retaining ring is a disc-shaped filter element 102 which can be made of any conventional filter material which is inert to the propellant and which is porous or permeable to the propellant. Such material is preferably a paper or felt of unsized or weakly sized cellulose fibres but glass fibre fabric or non-woven cotton and similar fibrous materials can also be used.

105 Preferably, the peripheral portion 103 of the filter element adheres to the inner, preferably concave, surface of the cutting edge 66e at the bottom of the retaining ring 66. The filter element 102 thus covers the entire cross-section of the flow path of the propellant, and therefore will filter out of the gaseous propellant any particles of adsorbent material which might be entrained in the gaseous propellant flow. Since the retaining ring 66 seals off the space within the cartridge 43 from the space within sleeve 70 and recess 65 in the bottom of the valve

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housing 2, gaseous propellant only is permitted to pass into the apertures 19 at the lower end of the valve stem 7.

5 The filter element 102 may be cut and assembled with the retaining ring 66 in a very simple and efficient operation the stages of which are illustrated in Figures 6a to 6d, so that the assembly may be positioned in the dispenser without any separate assembly step for the filter element. As shown in 10 Figures 6a and 6b, the retaining ring formed with the annular cutting edge 66e thereon is first dipped into an adhesive A. Thereafter, as shown in Figure 6c, it is positioned 15 above a sheet F of material of which the filter element 102 is made, and then urged downwardly into the sheet F so that the cutting edge 66e cuts through the sheet F to cut a filter element out of it as shown in 20 Figure 6d. The presence of the adhesive on the cutting edge 66e and adjacent portion 66f of the bottom of the retaining ring 66 together with the slight compression of the material of the filter element within the 25 cutting edge due to the concave form of the retainer bottom toward the cutting edge will cause the filter element to be retained within the cutting edge on the retaining ring when the retaining ring is withdrawn from the sheet F. Thereafter, when the adhesive sets, 30 the filter element will be firmly secured in the retaining ring. There is thus obtained an assembly of a retaining ring 66 and a filter element 102, which is ready for assembly 35 into the dispenser as a unit.

40 The dispenser is assembled by first mounting the plug valve means on the underside of the cover 1, and the gasket 15 is positioned in the recess 65. The propellant cartridge is then filled with the particles of adsorbent. The assembly of the retaining ring 66 and filter element 102 embodied in the 45 present invention is then positioned between the top of the propellant cartridge 43 and the gasket 15, and the adsorbent-filled propellant cartridge 43 and the plug valve means are joined together so as tightly to press the sealing gasket 101 and the flange 71 between the neck portion or collar 69 50 of the cartridge and the flange 68 at the lower end of valve housing 2, and with the parts held in this position, the remainder of the collar 69 is bent around the upper edge of the flange 68. This ensures a tight 55 sealing connection of the propellant cartridge to the plug valve means.

60 The cover 1 may then be placed on the product container C and the apparatus may be filled with the product to be dispensed in the conventional manner. The propellant gas under pressure is forced through filter 65 element 102 into the cartridge where it is adsorbed in or on the adsorbent particles.

When valve stem 7 is in the undepressed position, as shown in Figure 2, a tight

closure is ensured between opening 5 which communicates with the outside atmosphere as a result of a clearance provided for the sliding movement of the valve stem and the space under the cover 1, which is in 70 communication with the upper surface of gasket 4 through the passage or channel 32 (of which there may be more than one) in the lower face of the downwardly depending portion from cover 1. 75

When valve stem 7 is in this position, the inner peripheral edge of gasket 15 closes apertures 19 and tightly engages valve stem 7 so that a tight closure is ensured between 80 aperture 12 and the interior of propellant cartridge 43.

In operation, with the pushbutton depressed and the parts in the positions shown in Figure 3, the propellant will flow through 85 the hollow stem 7 and through the nozzle in the pushbutton and will aspirate the product to be dispensed through the dip tube 29 and the channels 21 into the nozzle. Because the filter element 102 is positioned 90 across the flow path of the propellant, it will filter out of the propellant any of the particles of adsorbent material which may have been entrained therein.

It will, therefore, be seen that there has 95 been provided a retaining ring and filter element assembly which can be easily fabricated and assembled with the plug valve means of a dispenser. It is no necessary to prepare filter elements 102 separately, coat 100 them with adhesive, or alternatively coat the appropriate surface of the retaining ring, and then properly position the filter element on the retaining ring and hold it in place while the adhesive sets. Two simple steps 105 suffice for both forming the filter element and assembling it with the retaining ring, the first being the coating with the adhesive, and the second being the pressing against the sheet of filter material to cut the filter element 110 therefrom and simultaneously position it on the retaining ring. The retaining ring in effect acts as the die punch for the filter element, and makes possible the combining of the two separate steps of cutting the filter 115 and then placing it on the retaining ring into a single step.

The valve-and-propellant assembly embodied in the invention may also be used in 120 dispensers for gaseous fuels such as propane in which case the pushbutton head is equipped with a well-known discharge nozzle in lieu of the Venturi-type aspirating nozzle. Annular flange 24 of valve shaft 7 is then 125 of such diameter that, in the non-dispensing position, it rests against the ridge 28 about the central aperture 5 in cover 1. The low pressure gasket 4 and product inlet 29, 31 as well as product ducts in the valve shaft and pushbutton are then, of course, superfluous and should be omitted. 130

The central aperture 5 can be much smaller than is shown in Figures 2 and 3.

For instance, the dispenser of which the valve means and adjacent portion of a propellant cartridge are shown in Figure 7 serves for dispensing an inflammable fluid. In this embodiment like reference numerals refer to like parts as shown in the preceding Figures. The flange 24 on valve shaft 7 is enlarged to flange 124 as shown, which rests, in non-actuated position, against the bead 128 about opening 5 in the cover 1.

When in the actuated position, bevelled rim face 126 of flange 124 comes to rest on the bevelled wall portion 106 of central passageway 6 in valve housing 2. While inflammable propellant flows through filter element 102, orifice 19 and duct 17 to the discharge nozzle 9 it aspirates air through orifices 123 and channels 121 which are provided between the valve shaft 7 and a dependent sleeve 22 of the pushbutton head in a manner known *per se*.

When the propellant gas/air mixture escaping from nozzle 9 is to be lit, a burning match may be used or a flint 50 and ratchet 51 as is used in cigarette lighters to strike a spark. Ratchet 51 is driven by means of a cog wheel 72 permanently connected therewith, and a rack 73 mounted on cover 1.

In order to hold the pushbutton 8 in its depressed position for some length of time, a recess 108 may be provided in the same into which a pawl 53, urged against the side wall of the pushbutton by a traction spring 54, may enter.

WHAT WE CLAIM IS:—

1. A retaining ring assembly for use with a propellant container of an aerosol dispenser in which container propellant under pressure is absorbed on an adsorbent and is releasable in gaseous form via a valve assembly including a valve shaft, a valve housing, a high pressure seal for controlling the flow of gaseous propellant and a discharge nozzle;

wherein the retaining ring assembly comprises a retaining ring for covering the opening of the container and having a base the outer edge of which is adapted to be secured to the valve housing and to the

container, the ring having a projecting part formed around a central opening for projecting into the valve housing and abutting against the said seal when the aerosol dispenser is assembled together, the side of the base of the retaining ring destined to face towards the interior of the container having a filter element secured thereto for preventing penetration of adsorbent particles into the valve shaft which element is, however, permeable to gaseous propellant.

2. A retaining ring assembly according to claim 1 wherein the container is filled with inflammable propellant adsorbed on a pulverulent silica carrier.

3. A retaining ring assembly according to claim 1 or claim 2 wherein the base of the retaining ring has a depending and outwardly flaring skirt formed with a ring-like cutting edge at its free end, the inner surface of the cutting edge forming a receiving surface on which the filter element is held in position.

4. A retaining ring assembly according to any preceding claim wherein the filter element consists of a disc of unsized or lightly sized cellulose fibre material.

5. A retaining ring assembly according to any preceding claim wherein the retaining ring is made of metal.

6. A method of producing a retaining ring assembly according to claim 3 comprising dipping said cutting edge into a bath of adhesive, placing the cutting edge on a sheet of filter material, and pushing the cutting edge into the filter sheet to cut out a filter element which will adhere by the inner surface of the cutting edge on removal of the retaining ring from the filter sheet.

7. A retaining ring assembly according to claim 1 substantially as herein described with reference to and as shown in Figures 1 to 6 or Figure 7 of the accompanying drawings.

8. A method of producing a retaining ring assembly according to claim 6 substantially as herein described with reference to and as shown in Figures 1 to 6 or Figure 7 of the accompanying drawings.

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Fig.1

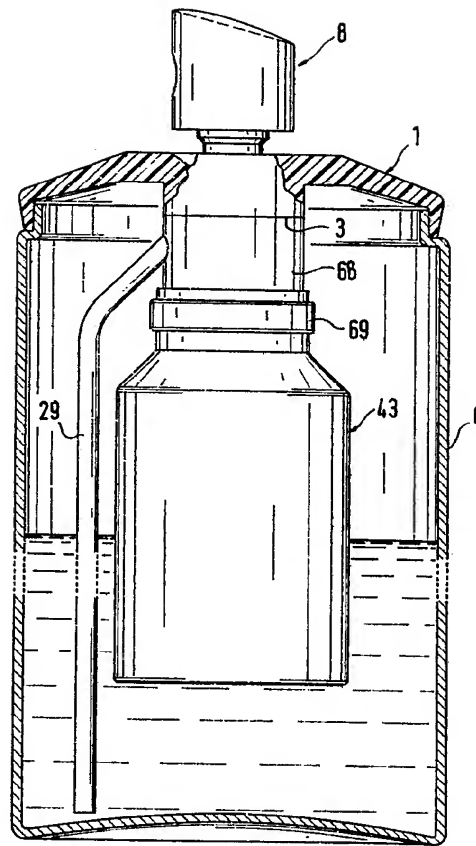


Fig.3

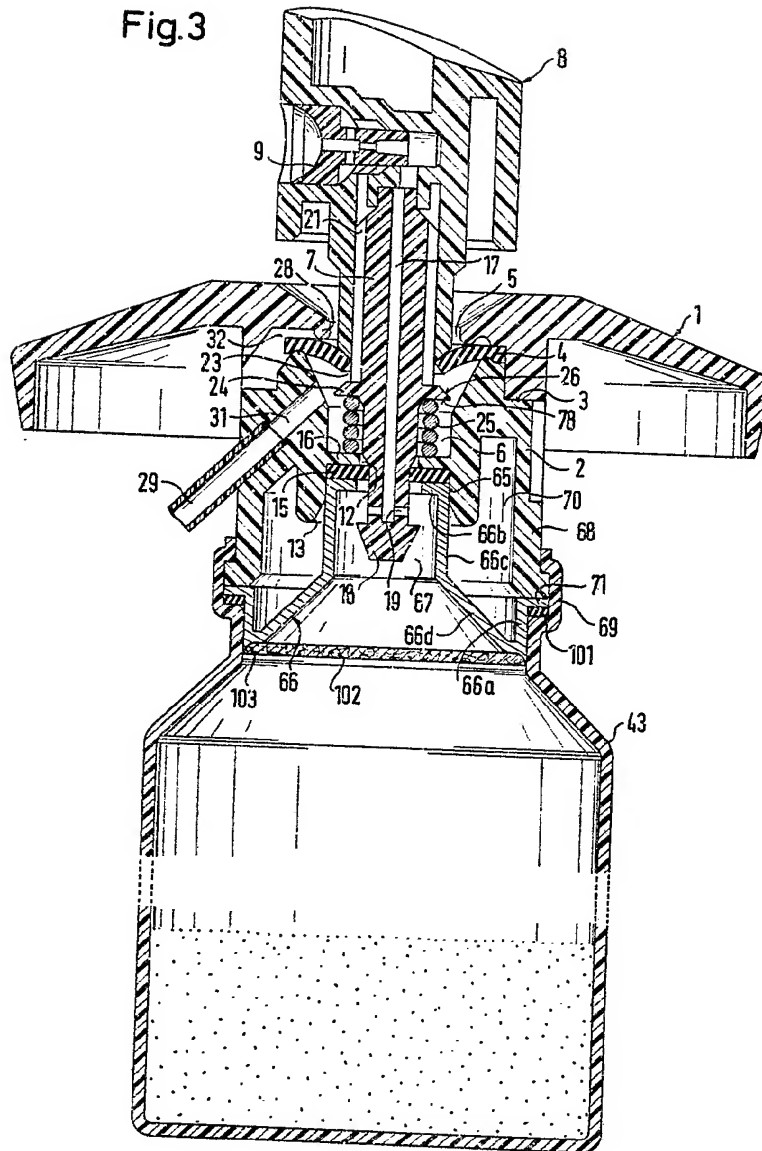


Fig. 4

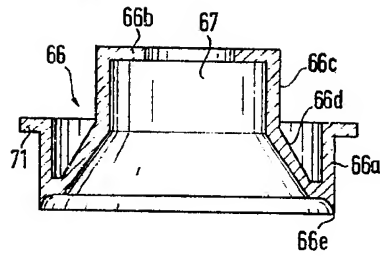


Fig. 5

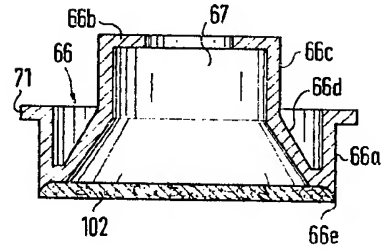


Fig. 6a

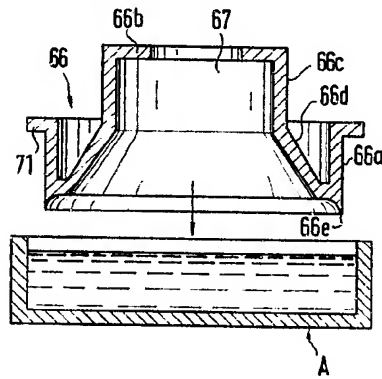


Fig. 6b

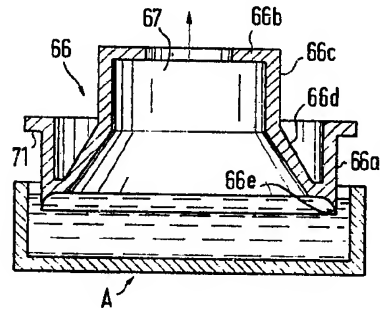


Fig. 6c

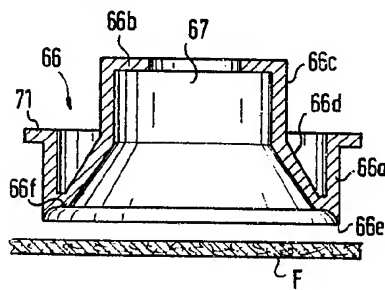


Fig. 6d

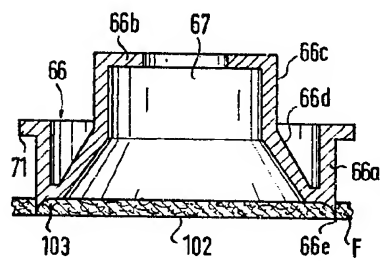


Fig. 7

